Claims

[c1] What is claimed is:

1.A method of driving a liquid crystal display (LCD) device, the LCD device comprising:

an LCD panel for displaying a plurality of pixels arranged in a matrix format;

a voltage selection circuit for outputting a plurality of driving voltage levels according to display data; and

a plurality of output buffers, each output buffer electrically connected to the voltage selection circuit and the LCD panel;

the method comprising:

(a) driving pixels located in a row by corresponding output buffers according to corresponding driving voltage levels generated from the voltage selection circuit;

(b) disconnecting the pixels from the corresponding output buffers; and

(c) connecting the pixels driven by the same driving voltage level for equalizing voltages applied on the pixels.

[c2] 2.The method of claim 1 further comprising turning off operating voltages inputted into the corresponding output buffers after performing step (b).

[c3] 3.The method of claim 1 wherein each output buffer is an operational amplifier.

[c4] 4.The method of claim 1 wherein the voltage selection circuit comprises a plurality of conductive wires each for carrying one of the driving voltage levels and a plurality of digital-to-analog decoders (DACs) each for selecting one of the driving voltage levels from the conductive wires according to display data.

[c5] 5. The method of claim 4 wherein the LCD device further comprises a plurality of switches each having a first end selectively connected to either an output terminal of the output buffer or an input terminal of the output buffer, and a second end connected to a corresponding pixel.

[c6] 6. The method of claim 5 wherein step (a) is performed by connecting the first end of the switch in the row to the output terminal of the output buffer.

[c7] 7. The method of claim 5 wherein step (b) is performed by connecting the first

end of the switch in the row to the input terminal of the output buffer.

[c8] 8. The method of claim 5 wherein in step (c) the pixels predetermined to be driven to the same driving voltage level are connected to the same conductive wire which delivers corresponding driving voltage level.

[c9] 9. The method of claim 1 wherein the LCD device further comprises:
a plurality of first switches each connected between an output terminal of a corresponding output buffer and a corresponding pixel; and
a plurality of second switches each connected between two adjacent pixels for selectively connecting the adjacent pixels.

[c10] 10.The method of claim 9 wherein step (a) is performed by:
turning on each first switch in the row for connecting the output buffer to the corresponding pixel; and
turning off each second switch in the row.

[c11] 11.The method of claim 9 wherein step (b) is performed by turning off each first switch in the row.

[c12] 12.The method of claim 9 wherein step(c) is performed by selectively turning on the second switches in the row.

[c13] 13.The method of claim 1 wherein the LCD device further comprises a timing controller for controlling driving sequence of steps (a), (b), and (c).

[c14] 14.The method of claim 13 wherein the timing controller comprises:
a frequency divider for dividing the frequency of a clock signal according to a predetermined divisor;
a counter for counting the divided clock signal to generate a count value; and
a comparator for comparing the count value with a predetermined number to generate a comparison result.

[c15] 15. The method of claim 14 wherein when the count value is equal to the predetermined number, the comparison result generates a voltage level transition, and step (b) and step(c) are performed.

[c16] 16. The method of claim 14 wherein the frequency divider comprises an input port for receiving an input data to set the predetermined divisor.

[c17] 17.The method of claim 14 wherein the comparator comprises an input port for receiving an input data to set the predetermined number.

[c18] 18.The method of claim 14 wherein the timing controller further comprises a logic controller, and the logic controller comprises a first input port for receiving the comparison result to determine timing to perform steps (b) and (c).

[c19] 19.The method of claim 18 wherein the logic controller further comprises a second input port for receiving an external clock signal, and the logic controller determines whether to perform steps (b) and (c) according to the external clock signal.

[c20] 20. The method of claim 19 wherein the logic controller further comprises a third input port for receiving a selecting signal, and the selecting signal is used for controlling the logic controller to adopt either the comparison result or the external clock signal.

[c21] 21.A liquid crystal display (LCD) device comprising:
an LCD panel for displaying a plurality of pixels arranged in a matrix format;
a voltage selection circuit for outputting a plurality of driving voltage levels according to display data;
a plurality of output buffers, each output buffer electrically connected to the voltage selection circuit and the LCD panel for driving the corresponding pixel by corresponding driving voltage level; and
a timing controller for controlling driving of the pixels, the timing controller comprising:
a frequency divider for dividing the frequency of a clock signal according to a predetermined divisor;
a counter for counting the divided clock signal to generate a count value; and
a comparator for comparing the count value with a predetermined number;
wherein when the count value is equal to the predetermined number, the output

buffers are disconnected from the corresponding pixels, and the pixels that are driven by the same driving voltage level are connected for averaging the voltage applied on the pixels.

[c22] 22. The LCD device of claim 21 wherein the frequency divider comprises an input port for receiving an input data to set the predetermined divisor.

[c23] 23.The LCD device of claim 21 wherein the comparator comprises an input port for receiving an input data to set the predetermined number.

[c24] 24.The LCD device of claim 21 wherein the timing controller further comprises a logic controller, and the logic controller comprises a first input port for receiving a comparison result outputted from the comparator to determine whether the count value is equal to the predetermined number or not.

[c25] 25.The LCD device of claim 24 wherein the logic controller further comprises a second input port for receiving a control signal, and the logic controller determines whether the output buffers are disconnected from the corresponding pixel, and the pixels that are driven by the same driving voltage level are connected for averaging the voltage inputted into the pixels according to the control signal.

[c26] 26. The LCD device of claim 25 wherein the logic controller further comprises a third input port for receiving a selecting signal, and the selecting signal is used for controlling the logic controller to adopt either the comparison result or the control signal.

[c27] 27. The LCD device of claim 21 wherein when the count value is equal to the predetermined number, operating voltages inputted into the output buffers are turned off.

[c28]

28. A driving device for driving a liquid crystal display (LCD) device, the LCD device comprising an LCD panel having a plurality of pixels arranged in a matrix format, said driving device comprising:

a voltage selection module comprising a power supply having a plurality of power transmission lines for carrying a plurality of voltages, and a plurality of

decoders each selectively outputting one of the voltages from the power transmission lines according to display data; and

a plurality of driving units each electrically coupled to the one of said decoders, each driving unit comprising an output buffer and a switch, a first end of said switch being selectively connected to either an output terminal of said output buffer or an input terminal of said output buffer, a second end of said switch being connected to an output terminal of said driving unit;

wherein the first end of said switch is first connected to the output terminal of said output buffer for driving an output voltage of the driving unit toward a voltage transmitted via one of the power transmission lines of said power supply, and the first end of said switch is then connected to the input terminal of said output buffer for driving the output voltage of said driving unit toward an average voltage generated from averaging voltages at output terminals of said driving units that are connected to the same power transmission line through corresponding decoders.

[c29]

29. A driving device for driving a liquid crystal display (LCD) device, the LCD device comprising an LCD panel having a plurality of pixels arranged in a matrix format, said driving device comprising:

a plurality of decoders each for selectively outputting one of a plurality of voltages according to display data;

a plurality of driving units each electrically connected to one of said decoders, said driving unit comprising:

an output buffer;

a first switch connected between an output terminal of said output buffer and an output terminal of said driving unit, the output terminal of said output buffer being electrically connected to the output terminal of said driving unit when said first switch is turned on; and

a second switch connected between the output terminal of said driving unit and an output terminal of another driving unit, the output terminal of said driving unit being electrically connected to the output terminal of another driving unit when said second switch is turned on;

wherein said first switch is first turned on to drive an output voltage of said

driving unit toward a voltage from corresponding decoder, and said second switch is then selectively turned on to drive the output voltage of said driving units toward an average voltage generated from averaging voltages at output terminals of said driving units.

[c30] 30. A driving device for driving a flat panel display including a plurality of pixels arranged in a matrix format, said driving device comprising:
a first driving units receiving a first voltage and being provided to drive the pixels of the flat panel display, said first driving unit comprising:
a first output buffer;
a first switch electrically connected between an output terminal of said first output buffer and an output terminal of said first driving unit;
a second driving units receiving a second voltage and driving the pixels of the flat panel display, said second driving unit comprising:
a second output buffer;
a second switch electrically connected between an output terminal of said second output buffer and an output terminal of said second driving unit;
a third switch electrically connected between the output terminal of said first driving unit and the output terminal of said second driving unit; and
a detecting circuit for controlling said third switch according to the first voltage and the second voltage.

[c31] 31. The driving device of claim 30, said third switch is turned on if the first voltage and the second voltage are substantially the same.

[c32] 32. A driving device for driving a flat panel display including a plurality of pixels arranged in a matrix format, said driving device comprising:
a first driving units receiving a first input driving data and being provided to drive the pixels of the flat panel display according to said first input driving data, said first driving unit comprising:
a first output buffer;
a first switch electrically connected between an output terminal of said first output buffer and an output terminal of said first driving unit;
a second driving units receiving a second input driving data and being provided

to drive the pixels of the flat panel display according to said second input driving data, said second driving unit comprising:

a second output buffer;

a second switch electrically connected between an output terminal of said second output buffer and an output terminal of said second driving unit;

a third switch electrically connected between the output terminal of said first driving unit and the output terminal of said second driving unit; and

a detecting circuit for controlling said third switch according to the first input driving data and the second input driving data.

[c33] 33. The driving device of claim 32 wherein said third switch is turned on if the first input driving data and the second input driving data are the same.